

Window on the World (WoW) : A shifting paradigm

世界への窓 (WoW)
—パラダイムのシフトを考える—

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ABSTRACT

This paper investigated the current studies into children, display devices, and consumption characteristics in the digital environment, referencing a selection of global regions. It used an historical study of children and television consumption from the 1990's as a control and lens to examine if new digital consumption behaviours have emerged as a result of the information age - an age where children are immersed in a cyberworld of abundant content, interactive interface technologies, and anywhere/anytime connectivity and accessibility. It identified key paradigm shifts in consumption viewing contexts, viewing technologies, and viewing habits as well as the physiological and psychological ramifications of this digital "window on the world" on children.

In the span of a generation in time between the original 1990's study and this current paper, with its parallel rise of the internet, shift from broadcast to pointcast, and dynamic change from passive to interactive consumption, children now are engaging and interfacing with the world in a new paradigm. The conclusions of this paper are that while the new 'WoW', with its greater intensity and immediacy, poses a greater risk on a child's health, social, academic, and character development, the burden-of-responsibility in overseeing child access and interaction remains with the parent. Parents are the 'frontline' in provision and supervision of this 'WoW'. The current trend of abrogating responsibility to schools or expecting government legislation to manage internet providers, content producers, and manufacturers, are avoidance strategies.

Categories and Subject Descriptors: children and smartphones, children and the digital age, children and social media, cognitive development, attention and focus, mental manipulation, communication skills, social skills, reaction times, health and addiction, responsibility vs dependence, risk vs convenience, visual/spatial capability, data recall vs data sourcing skills.

General Terms: window on the world, multimedia, information age, digital age, paradigm shift, disruption, digital convergence, knowledge-based society, child knowledge acquisition.

Additional Keywords and Phrases: broadcast, narrowcast, pointcast, connectivity, gesture and interface, interactivity, resolution, augmented reality, virtual reality, Internet of Things.

INTRODUCTION

In 1994, as part of a master's thesis¹, a qualitative ethnographic case study into children's viewing experiences of music videos was conducted. This research method sought to find what visually-stimulated children when exposed to music videos in different viewing environments (home, classroom, theatre); alternate screen-sizes (television vs projected-image); alternate venue atmospherics (solo, friendship-group, music-classroom); music video styles (pop/rock genres); music video formats (performative, narrative, conceptual); and an historical range of music videos (1950s~1990s).

Data collated from interviews, observations, anonymous surveys, and audio-recordings, examined how children may focus on various features of the music videos at the expense of others. It analyzed the nature of a child's gaze to determine if learning, meaning, or mental manipulation was taking place by evaluating the impact of the television industry's codes, conventions, and production methods ('technical features' - mechanics, formats, visual-grammar), and what factors may influence (or not) a child's consumption.

The dominant viewing platform or 'window on the world' (WoW) was, and since its golden age in the 1950s, the rear-projection CRT television for homes, institutes, and businesses. The metaphor 'window on the world' draws its meaning via the television's glass screen and the medium's ability to bring to the viewer a broader perspective of the globe than they would otherwise have. Technological innovations added colour-broadcast from the 1960s (Outdoor Antenna); media-playback device from the 1970s (VHS, BETA); added role as a display device for game-consoles or early home computers from the 1980s (ATARI, SEGA); to the large-scale television from the 1990s (Large 'footprint', power-hungry, ~700-line CRT resolution).

This last unit was the pinnacle in television performance-technology in the consumer market at the time the research was conducted. No classroom, loungeroom, or boardroom was without a television, and home ownership of televisions across first-world countries alone averaged two to three units per home. But what was the impact of this 'WoW' on

¹ Di Stasio, M., (1994). *Young adolescents viewing experiences of popular music videoclips*. Griffith University.



Figure 1: *TV Sunrise*⁴ - Michael Leunig (Cartoonist, Poet, Social Commentator)

children?

“TV Sunrise” (Figure 1.) was created by the Australian cartoonist and Australian Living Treasure², Michael Leunig³. It depicts father and son watching a “broadcast” sunrise while the “natural” sunrise is at their window. Leunig, a prolific artist and satirist, is celebrated nationally in Australia for his social commentary and life-observations

expressed in black-and-white art or poetry. Though drawn in 1974, his observations appear even more poignant now in the age of smartphones, tablets, PCs, LCDs, HD, 4G ...

The results of the 1994 case study concluded that children’s consumption of imagery was fundamentally for entertainment and spectacle, regardless of viewing-context or codes and practices of television production. These results echoed the findings of seminal writers on ‘children and television’ of that period, most notably Gunter & McAleer⁵ (1990) and Palmer⁶ (1986), who found that children did not associate entertainment-oriented programs with ‘learning’ nor for gaining ‘meaning’. The research results were further validated by the work of David Buckingham⁷ (1993:12), renowned for his publications on children’s interactions with electronic media, who stated: ‘When assumptions of ‘mind management’ of children by television are made, it is usually through an adult analysis of the supposed content’. Additionally, the parallel findings of John Fiske, another lauded scholar in this field, and stated in Fiske⁸ (1984:110), showed that children ‘are in fact highly competent, sophisticated viewers ... they actively make their own meanings and use television for their own purposes’.

² Australian Council of National Trusts. (2019, January 15). Retrieved from <http://www.nationaltrust.org.au>

³ Leunig, M. (2019, January 15). Retrieved from <https://www.leunig.com.au/>

⁴ Leunig, M. (1974). *The Penguin Leunig*. Penguin Books, Melbourne, Australia. ISBN 0140040196

⁵ Gunter, B. & McAleer, J.L. (1990). *Children and television: the one eyed monster*. London: Routledge.

⁶ Palmer, P. (1986). *The lively audience: a study of children around the TV set*. Sydney: Allen & Unwin.

⁷ Buckingham, D. (1993). *Changing literacies: media education and modern culture*. University of London.

⁸ Fiske, J. (1984). *Videoclippings*. Australian Journal of Cultural Studies, 2(1), 110-114.

In later years, subsequent trials of music videos with children were presented through alternate display contexts and media forms (IMAX, 3D, Interactive CD-ROM), and their responses further reinforced the findings of the original study that the primacy of focus remained on ‘spectacle’ or ‘wow!’ factor. These formats and devices were the leading viewing-technologies of the late-1990s, though their display-resolution/non-portability shortfalls (CRT and Kg) and limited platforms/device-options (TV or PC) were notably below today’s visual performance.

Fast-Forward to 2019 ...

This paper’s title-acronym ‘WoW’ infers a dual-meaning of both ‘access’ (WoW) and ‘excitement’ (Wow!) positing a need to explore the impact of current device display technologies and their immediacy-effect on children, as well as children’s perceptions of the options and content the digital age delivers (Figure 2.) in a search for behavioural-pattern shifts.



Figure 2: “Wow mum, it looks just like Google Earth!” - Oslo Davis⁹ (Cartoonist, Illustrator)

Since 1994, now a ‘generation’ ago, display contexts, broadcast conventions, and the technologies that drive them, have dramatically changed, with the most obvious shifts being the attributes of display devices themselves (1994’s device-immobility vs 2019’s device-portability) and content broadcast format (1994’s broadcasting/narrowcasting vs 2019’s web pointcasting). There is now far more “Wow!” (accessibility, interactivity, content abundance) as well as far more “WoW” (convergence of press/broadcast/film and text/audio/visuals into a single format and language - ‘multimedia’). It has created significant disruption to past conventional content-

delivery systems, and a substantial change in the nature-of-engagement.

Content-digitization has brought about this convergence of media formats and disruption to traditional media roles, thus creating a paradigm shift from mono-media to multi-media;

⁹ Davis, O. (2017). *Overheard - The art of eavesdropping*. Hardie Grant. Melbourne. ISBN 9781743793640

from media format to media content; from scheduled to real-time content; from distribution to on-demand content; from consumption to interaction; from passive audience to active user. This indicates that the model once used to evaluate children’s responses must be reviewed. Research conclusions held in the 1990s as they relate to children, television consumption, and media technologies, need to be re-examined as to their validity in 2019. At this point in time, our assumptions risk being ‘... a Timex watch in a digital age’¹⁰ without further scrutiny.

This paper compares current vs past device technologies and evaluates the key components behind the paradigm shift in consumption. It revisits the findings of the original research and examines the pros and cons of current devices against this background and discusses their resultant impact on consumption by children. In its conclusion, it proffers that monitoring, mentoring, and motivating children for responsible consumption is a parental responsibility.

DISPLAY DEVICES THEN & NOW: A SHIFTING ‘INTERFACE’ PARADIGM



Figure 3: *The Arrival of the Train* (1896) - Dir: Auguste and Louis Lumiere¹¹

Moving images have both captivated and covered humans since their advent in 1896 - the earliest public experience with the Lumiere brothers’ *Cinematographe* projecting a moving image of a train. Reported reaction of the adult-audience to this short-film was one of “shock”, with people in front rows racing to the rear of the theatre on seeing a train heading towards them.

For 123 years since, film-makers, television producers, game designers, and software creators have sought to exploit display device capabilities to heighten the user response and experience - to suspend disbelief. Now, visual/audio/touch/connectivity technologies, varying screen-size applications, and both static and portable device options, have taken us from passive viewer to interactive viewer. In 1994, children were ‘device-location’

¹⁰Fottrell, M. (Producer), & Wiseman, L. (Director). (2007). *Die Hard 4.0* [Motion Picture]. USA.

¹¹Lumiere, A. & Lumiere, L. (Directors/Producers). (1896). *The Arrival of the Train* [Short Film]. France.

dependent. In 2019, children are ‘device-anywhere/anytime-location’ independent (Figure 4.). Core tech-changes vs impact ...



Figure 4: *Pokémon GO* – Released JULY 2016. Augmented Reality (AR) for iOS | Android mobile devices¹²

Display devices selected for this discussion and comparison of child consumption patterns were based on those products accessible to children on a daily-basis - to match the child device-access environment of the 1994 research. Specifically, those devices were the television, smartphone, phablet, tablet, game console/screen, and the netbook/laptop/desktop computer.

Omitted from the discussion were the formats of AR (Figure 4.), VR, 3D, IMAX, IMAX-3D, Cinema, Cinerama, and Circle-Vision 360°, which are not in the realm of ‘daily-viewing’ by children. Apart from virtual or augmented reality devices, children have been able to experience 3D, Cinema, Cinerama, and IMAX since the 1960s~70s, though current resolution and sound technologies have improved substantially. Aspect Ratios (Figure 5.) and Screen Resolution/Size (Figure 6.) have been core developments, and markedly contributed to user-engagement and ‘Wow!’ factor via greater screen luminance, clarity, and field-of-vision.

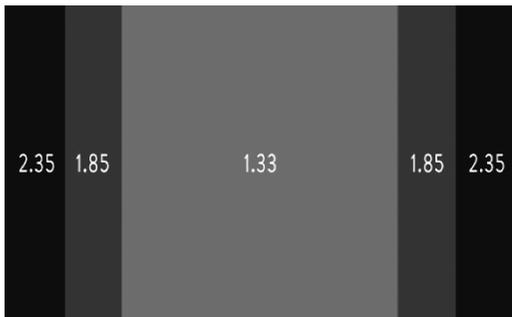


Figure 5: Screen Aspect Ratios: Film/TV/PC

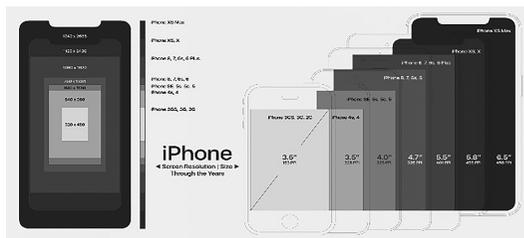


Figure 6: Smartphone (iPhone) evolution¹³

¹²Pokémon. ©2019 Niantic, Inc. ©2019 Pokémon. ©1995-2019 Nintendo/Creatures Inc./GAME FREAK Inc.

¹³Khan, S. (2017, September 19). iPhone screen resolution & size through the years. Retrieved from <https://www.google.co.jp/amp/s/www.geekcosmos.com/iphone-x-2g-screen-size-resolution-compared-infographic/amp>

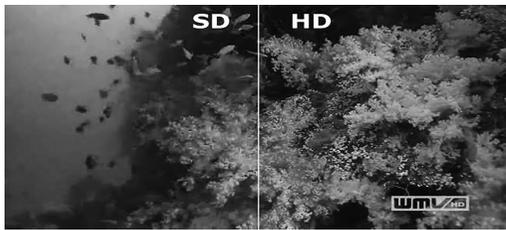


Figure 7: Screen Resolution: From Standard Display to Retina Display¹⁴

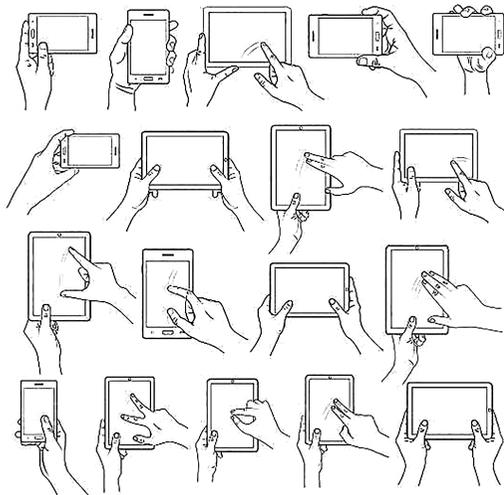


Figure 8: SCREEN manipulation and interaction¹⁵

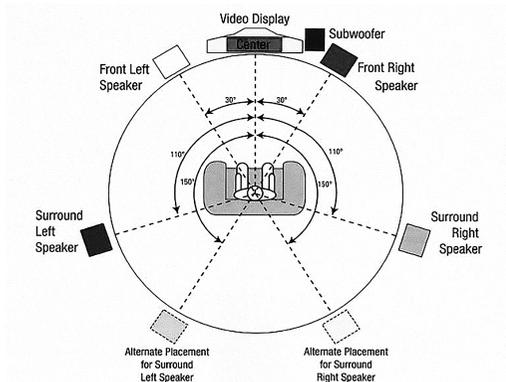


Figure 9: Home cinema systems have evolved: 2.1 to 5.1, 6.1, 7.1~ multi-channel/speaker setups (5.1 pictured)¹⁷

Resolution technology development from the CRT Standard Display of the 1990's to the Plasma Display to the OLED Display to HDTV through to current 4K, 8K, Retina Display bring dynamic visual realism to viewing (Figure 7.). Today's screen technologies reportedly decrease eye strain - a crucial factor for young eyes if true.

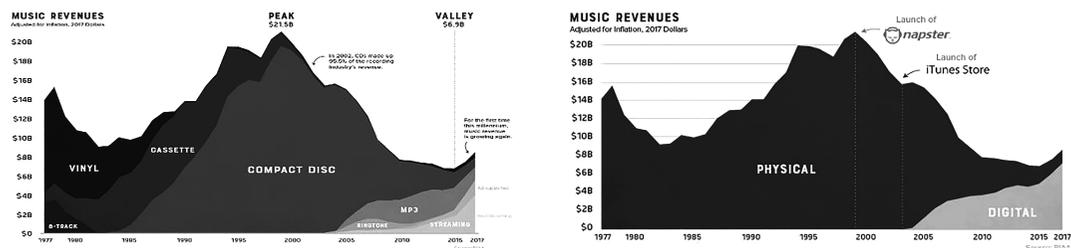
Touch and gesture became the new cursor for interfacing with our appliances and devices – a critical feature for interaction with the Internet of Things (IoT). Keyboard and mouse remain the fundamental tools for high-volume input and detailed data manipulation. But in the world of multimedia and child interaction, the keyboard and mouse are cumbersome. Instinctive gestures of touch, tap, drag, swipe, stretch, shrink, twist, shake, and rotate offered by digital devices are the physical ways children explore their world (Figure 8.), and arguably demonstrates why children quickly learn to drive modern devices ie. they can 'connect' intuitively with three of their primary senses - sight, hearing, and touch.

Audio standards for device displays from the 1990's to today also followed the global shift from analog to digital via PCM, DSD, MQA audio formats. Digital audio files were

¹⁴SD to HD Screen resolution (2010). damage Studio. [YouTube – Screen capture].

¹⁵Anonymous. (2018). Graphic River. [Pinterest post]. Retrieved December 1, 2018.

portable, durable, copyable, and editable. Audio devices became smaller and able to hold vast amounts of data. Lounge rooms became home cinemas with Hi-Res, Surround, or 3D-Sound (Figure 9.). Audio purchase/playback shifted to ‘download’ or ‘stream’, giving end-users a playlist ‘choice’, and disrupting the traditional physical audio market¹⁶ (Vinyl, Tape, CD - Figures 10. & 11.).



Figures 10. & 11.: RIAA 2017 Physical vs Digital Market

Summarizing these shifts in the physical interface itself, new technologies that emerged since 1994 have significantly heightened the display device experience - sight, sound, and touch. However, for children of the 2000s or even the 2010s, they were born ‘into’ this interface technology. What they see, hear, and do with the current interfaces, and how they view the quality of images, sounds, and controls are simply taken for granted as de rigeur. Any ‘Wow!’ they experience has little to do with the ‘gadgets’, and all to do with the ‘discovery’.

In the 1990s, and in previous decades, the television adorned a corner of the lounge room with all chairs pointed at it - arranged almost like an altar and pews in a church. The television was a key part of home furnishings. Families watched a shared screen, as opposed to today’s homes with function-over-form flat-screens and personalized viewing environments such as computers or smart-devices. In the 1990s, sound and vision were broadcast by RF signal to roof-antennae for television, or by copper-wire for cable-tv and dial-up internet access - as opposed to today’s digital broadcast and fiber/broadband/satellite internet systems. Hard disk storage capacity doubles annually, computing speed doubles bi-annually, and internet speed growth is 50% per annum. The flow, volume, and visual/audio quality of the data reaching the end-user has grown exponentially. We have

¹⁶Routley, N. (2018, October 6). *The visual capitalist: visualizing 40 years of music industry sales*. Retrieved from <https://www.visualcapitalist.com/music-industry-sales/>

¹⁷*Guide to Home Theater Receivers and Surround Sound*. (2018). [Product Catalogue]. Onkyo Corporation.

Accessibility & Connectivity & Penetration: Terrestrial, Cable, and Satellite are still the key broadcast conduits, with the global number of television-households (Digital Cable, Analog Cable, IPTV, Pay Satellite, Free-to-Air Satellite, Analog Terrestrial, Free-to-Air DDT, Pay DTT) currently in the order of 1.7 billion in 2018²⁰. Television broadcast systems continue to evolve and are now entwined with the internet, as from 2014, following the advent of Digital Television in 2010, new services to bring broadcasting ‘on-line’ saw the introduction of Smart Television. Adding the statistics of mobile device and internet usage, the penetration-figures for access to news, information, and entertainment is in-excess of two-thirds of the world with a staggering 5.04 billion indexed online pages²¹ - with English, Chinese, Spanish, Arabic, and Portuguese as the ‘Top 5’ net-languages (Wikipedia: January 2019).

The paradigm for the delivery of news, information, and entertainment has shifted from broadcasting (unilateral communication to a mass audience ie. wide transmission of content without targeted differentiation between viewers) - the core medium for children in 1994 - to narrowcasting (targeted group: communication to a specific demographic or subscriber) and onto pointcasting (one-on-one: a precise narrowcasting of content to a specific individual).

CHILD CONSUMPTION HABITS OF TELEVISION - A 1990’s RETROSPECTIVE

The research study cohort comprised 40 male and female young-adolescents aged between 12 - 15 years. However, a subsequent post-research study with a larger field of younger pre-adolescent children aged 7 - 11 years produced similar responses and feedback, corroborating the initial findings. The cohort’s family backgrounds were lower-middle-class, and they were students at a co-educational private school. The study was completed over a 12-month period.

The media form used to explore child reaction and gaze was the music video. This was chosen as the tool to stimulate and elicit response for two core reasons:

²⁰Murray, S., (2018, October 24). *Global TV databook, 2015-2018*. Research And Markets. USA.

²¹*The size of the World Wide Web*. (2019, January). Retrieved from <https://www.worldwidewebsite.com>

1. Children's familiarity with the core material; their identifying with the artists and music; and its capacity to sustain interest through the allure of the entertainment world.
2. Music video's production-making technique parallels with the structure of commercial advertising whose object is to "engage and sell" by using imagery to arouse the senses.

In order to evaluate the impact of television on this child cohort, and children generally, the approach was to firstly determine the various consumption 'forms' of television-viewing. Six distinct types were identified: viewing as 'habit', to 'learn', for 'companionship', for 'escape', for 'arousal' and for 'relaxation' (Gunter & McAleer, 1990, Palmer, 1986). In 1994, these forms served as the template for analysis, and a means to validate the study's premise that consumption of music videos by children was in terms of their recognition of the technical form of combining music and image to provide entertainment and spectacle - rather than young minds subject to mental manipulation.

Using the primary screen of its time (rear-projection CRT television) these six consumption forms acted as the 'control' for the analysis of current consumption behaviours by children in this new digital device paradigm (smartphones, tablets, phablets, game consoles, computers, television). The physical and delivery parameters of devices in 2019 and 1994 are poles apart in performance options eg. multi-screens vs sole screen; portable/static devices vs static device; content immediacy vs scheduled content; on-demand connectivity vs programmed; interactive user vs passive user; and pointcast vs broadcast delivery. The following are the findings from the original research era ...

Viewing as Habit: Gunter & McAleer (1990) argued that viewing out of 'habit' or as a way of filling or passing time was the most prominent reason for television watching. According to Gunter & McAleer (1990), children who stated they watched television out of 'habit' were more likely to watch comedy or light entertainment. In parallel research, Palmer's (1986: 35) findings also supported the primary viewing response as 'filling in time'. The prominence that viewing out of 'habit' exhibits of children's television consumption belies the often-held view of children as 'passive receivers'. The nature of the material selected represented an appropriate source of active choice by children. Choosing

this material as a ‘time-filler’ could hardly be equated to the criticism of television controlling the child’s mind.

Viewing to Learn: ‘Learning’ can be both a direct result from selecting informational, drama, or entertainment programs or as an incidental by-product of viewing (Gunter & McAleer, 1990). This ‘learning’ can be further categorised into ‘learning about things’ and ‘learning about myself’. Television has been seen to offer alternatives to children for coping with their emotional and social needs. This has come in the form of available information on the screen that may be ‘unavailable in their own environment’ (Gunter & McAleer, 1990: 19).

Research was also critical of the information-transfer by television. How television deals with the way the real world operates or with emotional and social issues had come under scrutiny from many researchers. Fiske & Hartley²² (1989: 23), for example, dispute the ‘realities’ that television presented of the real world at work. De Fleur (In Fiske & Hartley, 1989: 22) also states that ‘television may be instructing children in ways that are not readily apparent’, leading to disappointments as to how the world is in-reality. These elements suggested a far from positive viewpoint of television’s ‘teaching’ power. Gunter & McAleer (1990: 18) stated that ‘incidental’ learning ‘may be the most significant kind of learning from television’.

While adolescents may find this to be an alternate method to satisfy emotional or social needs missing in their environment, the ‘learning’ taking place from viewing videoclips is not their primary purpose. Fiske & Hartley, and De Fleur did not discuss this incidental by-product of ‘learning’ from television. Their arguments contest more the direct portrayal of information or social and emotional issues in forming attitudes and moral perspectives in children.

Viewing for Companionship: Behavioural patterns for viewing television vary ‘not only according to program interest, but also in relation to their viewing company’ (Palmer, 1986: 92). This companionship viewing takes three forms. Firstly, watching with family, which promotes a ‘sharing in the enjoyment of programs’ (Gunter & McAleer, 1990). Secondly, watching with friends, which both Gunter & McAleer (1990) and Palmer (1986)

²²Fiske, J. & Hartley, J. (1989). *Reading television*. London: Routledge.

identify as conversation material and viewing experience sharing with peers. Finally, watching with ‘fantasy’ friends, where children form ‘para-social’ relationships with television characters because of their lack of friends (Gunter & McAleer, 1990: 21). Each audience-context, meaning ‘family’, ‘friends’ or ‘fantasy friends’, exhibits some level of influence as to the responses and reactions of a child’s viewing experience through attitudes and tastes exchanged in their conversation and interaction.

Viewing for Escape: The ability of television ‘to offer an escape or a source of distraction from everyday realities’ (Gunter & McAleer, 1990) is a fundamental feature of the function of television. Gunter and McAleer also identified a range of child motives such as escaping unhappy experiences at school; escaping an unpleasant home environment; and escaping peer or social acceptance problems through television fantasies or dreams. The nature of light entertainment to which videoclips belong, offers visual images far removed from the daily experiences of children. While the research indicated that children used television as an escape, it did not suggest that they were immersed in a fantasy world themselves.

Viewing for Arousal: Television viewing tendencies are ‘underpinned and shaped by ... stimulation-seeking tendencies’ (Gunter & McAleer, 1990: 23). Schramm (In Gunter & McAleer, 1990) found that television was predominantly used by adolescents for the pleasure of being entertained. This concept of ‘excitement’ is also supported by Palmer (1986), especially when programs deal with people/actions outside the normal experiences of children.

Viewing for Relaxation: Gunter & McAleer (1990: 24) reported that the viewing for relaxation phenomenon ‘was a process that allowed a child to experience soothing, comforting information’. Given the diversity of comedy and light-entertainment styles, this consumption pattern for children was highly likely.

CHILD CONSUMPTION OF THE NEW “WOW” - A CURRENT PERSPECTIVE

Anecdotal evidence derived from ‘observation and interview’ (children of extended-family and friends, child-care centres, children in public spaces and venues, children in various transit modes etc) and examination of current literature on ‘children and smart devices’

show remarkable parallels in consumption behaviours with past studies in the 1980s/1990s. These forms of consumption styles - habit, learning, companionship, escape, arousal, relaxation - are still valid and their findings are applicable today.

Similarly, past risks and criticisms leveled at television and its consumption by children since the advent of commercial broadcasting - device overuse, addiction, dependence, health effects, mental manipulation, inappropriate viewing content - are clearly echoed in current reports and in device consumption research in this new millennium. In short, our concerns about the impact of this new ‘window-on-the-world’ on children remain the same as a generation ago. Children face the same threats, and parents face the same fears.

The enormous paradigm-shift or “Wow!” in device performance 1994 vs 2019 would suggest a measurable change in consumption behaviours by children. However, this “Wow!” factor does not have any bearing on child behaviour. Collation of research results^{23 24 25 26} from a selection of studies into the pros and cons of smart-devices and television usage in Asia, Europe, and the United States, yielded the following table of merits vs risks:

MERITS	RISKS
CONVENIENCE: Child-tracker Crisis-communication	SAFETY: Social Media Bullying Online Stalking
RESPONSIBILITY: Personal development	UNDISCIPLINED USE: Physical fatigue Sleep-loss
INDEPENDENCE: Self-reliance and Self-motivation	DEPENDENCE: Unhealthy addiction to digital interface
KNOWLEDGE ACQUISITION: Information resource	DEVELOPMENT: Cognitive Esteem Social issues
TECHNOLOGY SAVVY: Systems Benchmarks	MANIPULATION: Malleable minds of children
WONDER & ‘WOW’: Inform, Inspire, Entertain	‘WOW’ DRAWBACKS: Excessive Entertainment/Games

Table 1.: Pros and Cons of smart-devices and television usage

This research from both western and eastern countries cited earlier, examined child consumption patterns through the following five physical parameters:

1. **Access to devices:** device types, location access, day/night/weekday/weekend access.
2. **Access to internet:** available or unavailable, location access, landline or WiFi/4G.

²³Hsin,C., Li, M. et al. (2014). *Journal of educational technology & society*. Vol.17, No. 4, pp. 85-99. Taiwan.
²⁴Ofcom: Office of Communications. (2017). *Children and parents: Media use and attitudes report*. UK Gov.
²⁵Kwon, M., Kim, D. et al (2013). *The Smartphone addiction scale*. PLoS ONE Vol. 8, No. 12. Korea.
²⁶Robertson, L., McAnally, H., Hancox, R. (2013) *Childhood and adolescent television viewing and antisocial behavior in early adulthood*. In *Pediatrics*. Volume 131. Issue 3: 439–446. USA.

3. **Time spent on device:** hours per day, time of day, weekly/monthly average.
4. **Time spent online:** hours per day; time of day, weekly/monthly average.
5. **Use of Device:** knowledge/information acquisition vs gaming/social media/YouTube.

This access/time/use parameters list is similar in form to analysis-fields of 1990s television consumption patterns. Replacing ‘antenna’ for ‘internet’ for the signal reception, and ‘on’ for ‘online’, and the only variant is ‘social media’.

The earlier merit/risk chart (Table 1.) shows parallel results to 1990s television consumption behaviours - apart from ‘convenience’ or ‘safety’ - as television was not a monitoring nor communication device, though it was often used as a ‘convenient’ baby-sitting device.

Re-interpreting the six child consumption forms of media - ‘habit’, ‘learn’, ‘companionship’, ‘escape’, ‘arousal’, ‘relaxation’ - used in the original study (Gunter & McAleer, 1990, Palmer, 1986), it can be noted that there is little change in current consumption behaviours or fears.

CONSUMPTION	MERITS	RISKS
COMPANIONSHIP	CONVENIENCE	SAFETY
HABIT	RESPONSIBILITY	UNDISCIPLINED USE
AROUSAL	INDEPENDENCE	DEPENDENCE
LEARN	KNOWLEDGE ACQUISITION	DEVELOPMENT
RELAXATION	TECHNOLOGY SAVVY	MANIPULATION
ESCAPE	WONDER & ‘WOW’	‘WOW’ DRAWBACKS

Table 2.: Consumption Forms and Merits vs Risks

The core difference that the list and chart bring to the surface is that a child can be directly ‘reached’ - in either a benign or threatening way. The ‘internet’ allows two-way discourse, while the ‘antenna’ only provides a one-way stream. The new risk-factor is thus - ‘access’.

Child media-consumers born this century (all are between 0 ~ 18 years of age as at December 2018) experience three media forms: broadcasting, narrowcasting and pointcasting. As we have seen, they literally have at their fingertips a plethora of device-display options from smartphones through to digital television which gives them 24/7 connectivity and access from any geographic location. The performance standards of these

technologies in vision, sound, and response are exponentially better than the those in the previous century. Consumption of those materials present the same risks and advantages as in the previous century.

The new concerns exhibited by parents, schools, and the wider community due to this two-way access by children are not misplaced. Global research on children and the media (or multimedia) tells us of risks to cognitive development, attention and focus, communication skills, and social skills as well as threats of mental manipulation and health damage due to excessive device or online activity. Two potential physiological threats that have been identified are: microwave radiation emissions (risk of greater incidence of developing brain cancer), and health effects (referred to as the ‘blue-light effect’, as light emitted from smart devices is reputed to cause changes in brain-activity, reaction time, and sleep patterns).

MWR: All mobile devices emit microwave radiation (MWR) emissions²⁷. Risk of developing brain cancers from frequent use of devices is a solid theoretical premise, as MWR is regarded as carcinogenic. However, the International Agency for Research on Cancer (IARC), American Cancer Society (ACS), World Health Organization (WHO) state that the causal evidence is still insufficient and not established, though they promote ongoing research to reach a definitive answer.

Blue Light: Smart devices emit blue light (blue wavelengths), as do all electronic devices and modern lighting. Blue light is known to boost response, mood, and attention. Research at Harvard Medical School²⁸ determined that blue light changes brain-activity, reaction time, and sleep patterns – effecting circadian rhythms and potentially causing disease (Melatonin deficiencies). Children, whose brains are at their most vulnerable stage in development, face risks through device addiction and evening usage.

Regarding psychological threats, studies into the impact of device-use on cognitive

²⁷Naeem, Z., (2014). *Health risks associated with mobile phone use*. International Journal of Health Science. Qassim University. 8(4): V-VI.

²⁸*Harvard health letter: Blue light has a dark side*. (2018, August 13). Harvard Medical School. Retrieved from <https://www.health.harvard.edu/staying-healthy/blue-light-has-a-dark-side>

development (particularly mental-focus/manipulation) and social communication (particularly social awkwardness and impaired communication), suggested that addictive or antisocial behaviours could stem from sustained use. Some sample studies follow ...

Device Addiction: Kwon M., Kim D-J., Cho H., and Yang S. (2013)²⁹ designed a smartphone addiction scale and characteristics of smartphone usage in adolescents. The study's results were limited due to the nature of the field (region, demographic, gender balance, non-clinical setting), but the scale could be used to predict smartphone addiction or potentially high-risk children.

Antisocial Behaviours: The causes of antisocial behavior have often been blamed on the television medium, and now on smart devices. In Robertson, L., McAnally, H., and Hancox, R. (2013)³⁰, they examined whether excessive television viewing throughout childhood and adolescence was associated with increased antisocial behavior in early adulthood:

Many studies have identified an association between television viewing and antisocial behavior, although very few have been able to demonstrate a cause-and-effect sequence. The issue of whether excessive television viewing contributes to antisocial behavior remains controversial.

Excessive television viewing during childhood and adolescence was associated with objective and subjective measures of antisocial behavior in adulthood. These associations were not explained by preexisting antisocial tendencies or other potential confounders. Excessive television appears to have long-term psychosocial consequences.

More time spent watching television in childhood and adolescence is associated with antisocial behavior in early adulthood. These associations were not explained by preexisting antisocial behavioral problems, lack of parental control,

²⁹Kwon M., Kim D-J., Cho H., Yang S. (2013). *The Smartphone addiction scale: Development and Validation of a Short Version for Adolescents*. PLoS ONE. Volume 8. Issue 12.

³⁰Robertson, L., McAnally, H., Hancox, R. (2013). *Childhood and adolescent television viewing and antisocial behavior in early adulthood*. In *Pediatrics*. Volume 131. Issue 3: 439-446.

socioeconomic background, or IQ. We believe that identifying ways to reduce children's and adolescents' television viewing should be considered a priority for public health.

While their research identified existing macro-variables and traits, they dismissed substantial historical findings and evidence that “pre-existing” factors of antisocial behavior, lack of parental control, socio-economic background, or intelligence quotient, contribute squarely to antisocial or sociopathic behavior in young adulthood. Their lack of empirical evidence and false-equivalence in labelling children that spend large blocks of time watching television as manipulated or predisposed to antisocial behavior was even contradicted in their own words:

... very few have been able to demonstrate a cause-and-effect sequence.

And ...

The issue of whether excessive television viewing contributes to antisocial behavior remains controversial.

Buckingham's (1993) findings into mental-manipulation of children towards antisocial behaviour and acts of violence via the influence of electronic media (videogames and television) were that it was highly unlikely to foment those attitudes. He further stated that such actions were committed by a very small percentage of children or young adults who were, in all probability, pathologically-inclined to perform such acts anyway, and that television or game-imagery acted as the trigger.

Neither of the psychological-research studies above have definitively shown a clear clinical finding, though their work does point a direction for further examination. There also appears to be gaps in their research as it relates to social disenfranchisement and disaffection of children towards society such as: ramifications of government austerity policies on education programs; institutional education and rigid curriculums; impact of socio-economic or perceived social status; and the cultural, regional, social, gender contexts of informants' backgrounds.

³¹Nishimura, K. (2017, October 27). Survey: 20% of babies exposed to smartphones almost daily. *Asahi Shimbun*. Retrieved from <http://www.asahi.com/ajw/articles/AJ201710250048.html>

From a very tender age, children are interacting with smart devices³¹. They are learning to manipulate and process information in a very different manner. Conventional educational thinking is that a 'book' develops a child's ability to focus and use their imagination, whereas 'internet' does not foster these skills. However, the internet has triggered the development of another skillset in children - the ability to scan information rapidly and efficiently. Where a child may not be able to recall information (rote learning), they can recall location (where and how to source the information), and identify the data needed for a solution amongst the sheer abundance and clutter of the internet. This shows advanced visual/spatial capabilities. The future-child will set aside a linear/temporal approach to problem-solving and enquiry and will shift to a non-linear/spatial approach, where mixed-media and hypertext rule. The digital medium and its devices are more dynamic and user-centred in the era in which these children will engage. The aim of parents, teachers, and society should be to monitor a child's usage-rate, guide/filter their usage-access, and help them sort internet-fact from internet-fiction.

CONCLUSIONS

Device purchases, device contracts, device gifting, and device access for children are 'adult-produced' actions and decisions. Children need to be monitored, mentored, and motivated to develop positive habits in the use of device technologies in order to prevent self-harm, harm to others, or harm from outsiders. Educators, content producers, manufacturers, and governments also have a role to play in developing better systems, safeguards, and recommended-practices to maximize usage merits and minimize usage risks by children. But parental mediation remains the front line in managing children's access to this window-on-the-world, as across both periods of research studies, the 'constant' has been the need for child supervision.

A parent's most common fears for their child's experience on the internet are primarily: age-inappropriate content, contact with unknown people, and over-sharing personal data. The next level of parental concerns are: belief in everything-on-internet, spyware/malware/virus downloads, and cyber-bullying. Children may access devices, but parents enable that access. When parents use devices as digital-pacifiers; or relegate the bulk of the responsibility of internet/device guidance to a third-party; or simply do not manage their

child's online/device activities, they become part of the problem rather than part of the solution. The paradigm for media and device engagement has shifted away from their own generational-experience of broadcasting and passive/unidirectional reception, to their child's new generation, window-on-the-world experience of pointcasting - an active/seeking/interactive-style of engagement in a globally connected environment.

Parents have a duty to inform themselves as well as inform their child on how to navigate through this window-on-the-world. This two-way window-on-the-world has immense value as well as a toxic side. Blaming the digital medium is a 'reaction'. What is needed is 'action'. So, a preventative approach rather than a reactive approach to developing a child's interaction with this medium is the key ie. manage the access, supervise the usage, communicate with the child.

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